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WASTE MANAGEMENT®

SpecFUEL™

Comparative Information For Antimony, Fluoride and DEHP

INTRODUCTION

In March 2012, Waste Management (WM) submitted a request for a comfort letter determination that SpecFUEL is a non-waste fuel pursuant to the final rule entitled "Identification of Non-Hazardous Secondary Materials that are Solid Waste", published at 86 Fed. Reg. 15456 (March 21, 2011) and codified at 40 CFR Part 241 (the "NHSM Rule"). WM's submission sets forth a demonstration that SpecFUEL meets the legitimacy criteria set forth in 40 CFR §241.3(d), including that SpecFUEL contains contaminants at levels comparable in concentration to those in traditional fuels (coal, wood, fuel oil and pet coke). In follow-up communications in September 2012, EPA requested that WM provide further information with respect to antimony and fluoride as constituents in SpecFUEL as compared to traditional fuels. WM submitted the requested information on September 7, 2012. In light of additional questions raised by EPA during subsequent phone conversations between EPA representative Jim Berlow and Max Lee of Koogler & Associates, consultant for WM, the following supplemental information is submitted herein: (1) information supporting a comparison for antimony grouped as a low-volatile metal; (2) information supporting a comparison for fluoride grouped as a total halide; (3) information relating to bis(2-ethylhexyl)phthalate (DEHP), an organic HAP; (4) information supporting the use of databases cited by WM in its submissions; and (5) information supporting the use of statistical approaches identified in WM's submissions. Based on this analysis, we believe that the results of this comparison show that SpecFUEL is comparable to traditional fuels for all constituents including antimony, fluoride, and DEHP.

DISCUSSION

1. Antimony

In data previously submitted by WM, antimony was grouped as a low volatile metal (LVM) for purposes of contaminant comparisons. In grouping antimony in this manner, WM followed the Agency's determination as set forth in its National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors, 40 CFR Part 62 Subpart EEE. See 40 CFR 63.1219(e)(4): ("...low volatile metal feedrate limits apply to arsenic, beryllium, chromium,

antimony, cobalt, manganese, and nickel, combined."). The Agency's proposed "Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Proposed Amendments; Non-Hazardous Secondary Materials That Are Solid Waste," 76 Fed Reg. 80452 (December 23, 2011) (the "NHSM Reconsideration Rule"), further supports this determination, as cited below.

> *While persons may satisfy the contaminant legitimacy criterion on a contaminant-by-contaminant basis, comparing groups of contaminants in the NHSM to similar groups in traditional fuels could also be appropriate, provided the grouped contaminants share physical and chemical properties that influence behavior in the combustion unit prior to the point where emissions occur. Volatility, the presence of specific elements, and compound structure are three such properties.*

76 Fed. Reg. at 80477. LVM, as verbally noted by Jim Berlow, are a valid grouping (i.e. they share physical and chemical properties that influence behavior in the combustion unit prior to the point where emissions occur). As provided in the September 7, 2012 submittal and discussed between Max Lee and Jim Berlow, the LVM average concentration of SpecFUEL is 87.3 mg/Kg compared to the LVM average concentrations identified in EPA OAQPS database, which cites an average concentration of 324.7 mg/Kg in wood/biomass and 79.8 mg/Kg in coal. (Note, EPA cites its OAQPS databases in the Guidance entitled "Contaminant Concentrations in Traditional Fuels: Tables for Comparison" dated November 29, 2011 (the "Contaminant Comparison Guidance") posted on EPA's website at http: //www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf.)

Based on the above, WM concludes that the concentration of antimony in SpecFUEL, grouped as a LVM, is demonstrated to be comparable to traditional fuels.

2. Fluoride

Following its September 7, 2012 submission, and pursuant to phone conversations with Jim Berlow, WM provides herein additional information supporting its comparison of fluoride concentrations in SpecFUEL to traditional fuels. As described above with respect to antimony, WM notes that fluoride may be grouped in the manner suggested in EPA's Reconsideration Rule preamble. Fluoride is appropriately grouped in a total halides category, consisting of fluoride, chloride and bromide.

In this comparison shown in Table 1, the total halides category for SpecFUEL yielded a 90th% upper prediction limit ("UPL") of 3416 mg/kg. This value is largely dominated by chlorides, with fluorides also significantly adding to this total. In the case of coal, the maximum value seen in this grouping is 14,140 mg/kg, which is over four times higher than SpecFUEL's total halide value. This maximum value for coal is once again dominated by chlorides. In fact, if

fluorides were not even considered and total chlorine in coal was compared to the total halides in SpecFUEL, the chlorine value is still much higher in coal, using values in the EPA-OAQPS database.

Additionally, if a straight comparison of the 90% UPL value for fluoride with the USGS coal database is made, it will be seen that the values are comparable. Set forth below in detail on p. 9 is information supporting the use of the USGS coal database, which includes only coal sourced from within the U.S. The high fluoride value reported in the USGS coal database is from a bituminous sample from Jefferson County, Alabama. Also, when further exploring the USGS coal database, it is reported that 49 samples had fluoride values above the 1,159 90th% UPL reported for SpecFUEL.

Based on the above, WM concludes that the concentration of fluoride in SpecFUEL, grouped as a total halide, is demonstrated to be comparable to traditional fuels.

3. DEHP

DEHP, or bis(2-ethylhexyl)phthalate, is a chemical that is mass produced and used in plastics, resins, consumer products and building materials. In general, phthalates are used as plasticizers to enhance the durability and flexibility of plastics and other polymers.[1] Thus, the presence of DEHP in SpecFUEL is not unexpected and would be anticipated in broad range of secondary materials sourced from post-consumer products or industrial or commercial waste. DEHP is synthesized through bulk manufacturing processes, and the resulting air releases at these manufacturing facilities are the reason for DEHP to be listed as a HAP. Therefore, DEHP should not be present in traditional fuel materials, and a direct comparison of DEHP to traditional fuels must consider that petroleum-synthesized plastic materials are not present in coal or wood/biomass. As such, a group comparison was again utilized for the contaminant comparison of this HAP, consistent with the NHSM Reconsideration Rule.

While coal and wood/biomass do not contain plastics materials, other organic compounds (HAPs) are prevalent in these traditional fuels. In the case of coal and described in the EPA Contaminant Comparison Guidance, there are several HAPs that can be potentially found in this traditional fuel. As such, a group comparison of all organic constituents (HAPs) was made. This compilation of HAPs includes volatile organic compounds, semi-volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs). While the NHSM Reconsideration Rule proposal states that total PAHs may be a distinct group (see Table 8 at 76 Fed. Reg. at 80479 and 80480), the Agency also makes clear that persons can use other approaches that they can show are technically reasonable (see 76 Fed. Reg. at 80477). We believe PAHs can and should be grouped with the other organic compounds, since PAHs are a compilation of organic compounds. In fact, according to the Laumann et al. (2011) document used by EPA for the

[1] Stiles, R., Yang, I., Lippincott, R.L., Murphy, E., Buckley, B. "Potential Source of background contaminants in solid phase extraction and microextraction." Journal of Separation Science. 30:1029-1036. (2007).

reporting of PAHs in the Contaminant Comparison Guidance, the PAH values used in this document included Naphthalene, which is defined by EPA as a semi-volatile organic compound (SVOC) in the NHSM Reconsideration Rule. See 76 Fed Reg. at pgs 80479 and 80480. As such, for the SpecFUEL pollutant comparison, the total grouping included all measured organic HAPs. In this comparison, the high values for coal were all reported by EPA in the traditional fuel comparison tables and no other literature sources were used. As seen in the attached table, the SpecFUEL 90% UPL results yielded a total organic HAPs concentration of 1,432 mg/kg whereas the coal high values yielded a total organic HAPs concentration of 2,243.4 mg/kg.

Through this comparison, it is demonstrated that SpecFUEL has organic HAP pollutant concentrations lower than what is possible for coal. As such, we conclude that that the contaminant comparison for DEHP in SpecFUEL, grouped as a total organic HAP, is comparable to traditional fuels.

Additional factors may also be considered regarding DEHP in SpecFUEL. EPA's definition of "contaminant" in the NHSM Rule includes (in pertinent part) "any constituent in non-hazardous secondary materials that will result in emissions of the air pollutants identified in Clean Air Act section 112(b) or the nine pollutants listed under Clean Air Act section 129(a)(4) when such materials are burned as a fuel...." 40 CFR §214.2. Through the Reconsideration Rule, EPA has proposed to add several elemental contaminants that are likely to cause the formation of HAPs during combustion. See 76 Fed. Reg. at 80471. EPA's preamble language in the NHSM Rule and in the Reconsideration Rule have addressed whether the contaminant comparison should be made on the basis of HAP constituents in the non-hazardous secondary material, or on the emissions resulting from the combustion of that material. EPA has clarified in the Reconsideration Rule proposal its view that it is the constituents prior to combustion that must form the basis of the contaminant comparison. Id. However, EPA has not addressed the circumstance that may be confronted with certain constituents, such as DEHP, that may be present at certain levels prior to combustion, but that would be effectively destroyed in the combustion process, and would not lead to the formation of other HAPs. In this circumstance, the definition of "contaminant" is controlling, and would dictate that the presence of a HAP constituent that is not otherwise capable of comparison, and that would not ultimately be emitted or lead to the emissions of other HAPs, would not prevent a favorable comparison with traditional fuels.

To evaluate this circumstance, EPA has developed and maintained an extensive database ranking of numerous organic compounds for their ease of thermal destruction.[2] This database is maintained today by the University of Dayton Research Institute. EPA established this ranking to predict the relative destruction efficiency of compounds when incinerated. While the absolute destruction efficiency (DE) of each organic compound is dependent on temperature and residence time in the flame zone, the relative DE is not sensitive to these factors. Thus, EPA developed a relative ranking of incinerability with the most difficult

[2] EPA/625/6-89/019, Guidance on Setting Permit Conditions and Reporting Trial Burn Results, Volume II of the Hazardous Waste Incineration Guidance Series, Table D-1.

compounds to thermally destruct ranked as *class 1* and the most easily ranked *class 7*. The University of Dayton Research Institute provided WM the most recent version of this database which is attached showing DEHP can be effectively (99 percent) thermally destructed at a temperature of 370 degrees C and residence time of 2 seconds. The ranking of DEHP as *class 6* out of 7 clearly shows that DEHP is a relatively easily-destructed compound in a combustion process. In comparison, PAHs include many contaminants that are extremely difficult to decompose and are ranked by EPA as *class 1* (most difficult to destroy). EPA's contaminant table references PAHs (see EPA table reference for Laumann, et al. (2011). PAH (52 extractable) maximum value of 2090 mg/Kg) includes compounds such as naphthalene, fluoranthene, benzo[b]fluoranthene, benz[a]anthracene chrysene, benzo[a]pyrene, dibenz[a,h]anthracene, dibenzo[a,i]pyrene dibenzo[a,e]pyrene – all of which are ranked *class 1*. In view of this relative difficulty to thermally destruct (i.e. potential release to the environment) of PAHs in coal, which are far greater in coal that in SpecFUEL (See Table 1), EPA should consider favorably the comparable relatively higher destruction efficiency of DEHP and thus the lower potential release of DEHP from SpecFUEL. This information bolsters the argument that SpecFUEL organics are comparable to coal.

4. Databases for Comparison

Through this submission, WM seeks clarification of which databases may be used for comparisons of contaminant concentrations in secondary materials and traditional fuels. As an initial matter, WM notes that the EPA Contaminant Comparison Guidance references datasets for coal, wood/biomass and fuel oils from various literature sources, including the EPA-OAQPS database. Since EPA ostensibly references these data sources for the express purpose of contaminant comparisons under the NHSM Rule, WM concludes these data sources are appropriate.

WM also seeks clarification of appropriate datasets for coal, beyond those identified by EPA on its website and in the Contaminant Comparison Guidance. During a phone conversation with WM consultant Max Lee, EPA representative Jim Berlow noted EPA's concern with the USGS coal database that WM used in its initial submissions for comparing SpecFUEL to traditional solid fuels. Mr. Berlow noted that the USGS database includes coal from places outside of the U.S. (e.g., Lithuania) that are not likely to be mined and used in the U.S. Mr. Berlow recommended that WM use data of coal from within the U.S.

Following that phone call, WM reviewed the USGS coal database[3] that was utilized in WM's September 7, 2012 submission. This referenced USGS coal database includes coal only sourced from within the U.S. Further, the USGS limited the data to the following conditions.

> *Samples have been selected from the USCHEM (USgeoCHEMical) database using the following criteria:*
> *1. GSASH data must have a positive value, not 0, in order to convert data on an ash-basis to a whole-coal basis.*
> *2. GSASH and STDASH data must be less than or equal to 33 percent (as-determined basis).*

[3] http://energy.er.usgs.gov/coalqual.htm (last visited October 3, 2012)

3. All data must represent complete-bed channel or drill core (SEE list of SAMPTYPE and VALREP values inTECHINFO.PDF. For some localities, data are represented by one sample obtained either by channel or core (Swanson & Huffman, 1976; Stanton, 1989). In other localities, data were calculated from weighted averages of samples taken sequentially to represent the bed thickness. (Weighted averages are calculated by normalizing the data to the total "bed thickness" using the individual sample thicknesses.)
4. Samples must have an ESTRANK (apparent rank) value which is not a rock type. (SEE list of ESTRANK values inTECHINFO.PDF)
Reference:(http://energy.er.usgs.gov/products/databases/CoalQual/Docs/techinfo.pdf)

We have attached a pdf of the 7,000+ data values used in the USGS coal database for your review. In further research, we have identified another database of coal which is compiled by the Kentucky Geological Survey and the University of Kentucky,[4] utilizing data based on coal strictly mined from the state of Kentucky. While we have not included this in our database of coal source information at this time, we note that the data from the Kentucky database shows similar and higher contaminant results compared to the USGS database.

We do note that the USGS does maintain another database that includes coal from other countries such as Lithuania, but that database has not been used in the materials we have submitted in our petition.[5] The databases we use are consistent with the discussion with Jim Berlow, in which he agreed that coal from countries such as Venezuela, South Africa, and Canada are acceptable for comparison in light of the fact that there are companies in the U.S. using coal from these locations. We note that the use of national surveys is allowed in the Agency's NHSM Reconsideration Rule preamble as cited below.

> *In comparing contaminants between traditional fuel(s) and a non-hazardous secondary material, persons can use ranges of traditional fuel contaminant levels compiled from national surveys, as well as contaminant level data from the specific traditional fuel being replaced.*

76 Fed. Reg. at 80471. Further, The Agency stated in the Reconsideration Rule preamble that coal of various forms may be grouped, as cited below:

> *...as it allows a person with a unit that can or does burn similar traditional fuels (e.g., anthracite, lignite, bituminous, and sub-bituminous coal) to group those traditional fuels when making contaminant comparisons."*

75 Fed. Reg. at 80477.

Conversely, we are not aware of any language in the NHSM Rule, the NHSM Reconsideration Rule or EPA guidance that would limit the source of the traditional fuel used

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[4] http://kgs.uky.edu/kgsweb/DataSearching/Coal/Quality/QualitySearch.asp (last visited October 3, 2012)

[5] http://pubs.er.usgs.gov/publication/ofr20101196 (last visited on October 3, 2012)

for comparison to the 48-intercontinental United States. Additionally, it should be noted that EPA utilized coal data from various countries for their compilation of traditional fuel data in the Contaminant Comparison Guidance and various hazardous air pollutant concentration ranges were defined for coal. For all of these HAPs, two references were used for the development of these values: Fernandez-Martinez (2000) and Laumann, et al. (2011). The referenced Fernandez-Martinez document utilized coal data from South Africa and Spain and the referenced Laumann document utilized coal data from Ukraine, Germany, Australia, South Africa, and many other countries as well.

Notwithstanding the above comments, WM has not included other country data in its comparisons for antimony or fluorides. However, we do believe that coal data from other countries should not be excluded simply based on a national border, when traditional fuels are transported between countries. For example, certain U.S. coal mining companies have recently signed significant long-term contracts to provide coal to the country of India. The following diagram shows some general global patterns of coal flow.[6] Accordingly, EPA should allow use of traditional fuel data from many other locations than the just 48 states in the lower intercontinental U.S.

5. Statistical Approach for Comparison

The original submittal from WM in March 2012 provided a statistical comparison of the SpecFUEL data. The comparison was made between the 90th% UPL (i.e., upper statistical range) of SpecFUEL to the maximum traditional fuel value. This methodology followed the guidance of the Reconsideration Rule. The UPL is the *upper prediction limit.* This rule preamble states:

> *Given data for a particular traditional fuel, it makes intuitive sense to base the traditional fuel comparison value on the upper end of its statistical range.* ***Anything less could result in "traditional fuel" samples being considered solid waste*** *if burned in the very combustion units designed to burn them—not the Agency's intent in either the 2011 NHSM final rule or today's proposed rule.*

76 Fed. Reg. at 80481.

WM believes the above statement clearly indicates that the maximum traditional fuel value should be used in comparison to the upper end of its (i.e., SpecFUEL) statistical range. Otherwise, as the agency states - some traditional fuel would be labeled solid waste by this comparison – which is clearly not the Agency's intent in the NHSM Rule.

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[6] World Coal Association, The Coal Resource: A comprehensive Overview of Coal. http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.worldcoal.org%2Fbin%2Fpdf%2Foriginal_pdf_file%2Fglobal_coal_market_price(01_06_2009).pdf&ei=v2xsUJ_vFumy2QWE0oH4BA&usg=AFQjCNEdWM7r4d7CKnDngUXKi24zI44uxg&sig2=aiCMZRc7VkSfARGLhEmXmg

Given that selection, acceptable NHSM comparison values would include the upper end of a statistical range, a calculation involving the mean and standard deviation, or perhaps a single data point in situations where data are limited. It would not be appropriate to compare an average NHSM contaminant value to the high end of a traditional fuel range, as the existence of an average implies multiple data points from which a more suitable statistic (e.g., range or standard deviation) could have been calculated.

Id.

Based on the information set forth above, WM believes the UPL (as defined in the rule) at the 90th% for the sample SpecFUEL data is appropriate to compare to the maximum value of traditional fuels.

SUMMARY

Based on the foregoing and previously submitted information, WM believes that the comparison between contaminant concentrations present in SpecFUEL, and those present in traditional fuels, demonstrate that SpecFUEL meets the "contaminant comparison" legitimacy criterion under the NHSM Rule.

ATTACHMENT 1

USGS U.S. COAL DATABASE

Summary of metals and halides samples data

Source: http://energy.er.usgs.gov/coalqual.htm

ATTACHMENT 2

EPA Traditional Fuel Database

EPA website post date November 29, 2011

http://www.epa.gov/osw/nonhaz/define/pdfs/nhsm_cont_tf.pdf

ATTACHMENT 3

EPA Ranking of Thermal Destruction Efficiency

EPA/625/6-89/019

Maintained by Dr. Phil Taylor, UDRI